

REMARKS

The Official Action dated April 30, 2004 has been received and its contents carefully noted. In view thereof, claims 1, 3 and 5-8 have been amended, and new claims 9-14 have been added in order to better define that which Applicant regards as the invention. Accordingly, claims 1-14 are presently pending in the instant application.

Referring now to the Official Action particularly page 2 thereof, claims 1-3 and 5-8 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,113,685 issued to Wang et al. in view of U.S. Patent No. 6,426,519 issued to Asai et al. This rejection is respectively traversed in that the combination proposed by the Examiner neither discloses nor suggest that which is presently set forth by Applicant's claimed invention.

In accordance with the present invention, one feature resides in the fact that distortion is caused between the top portion of the base substrate and the semiconductor layer, i.e. at the interface between the raised portion of the base substrate and the semiconductor layer. Accordingly, cracks are generated at the interface thereby separating the Group III-V nitride semiconductor layer from the base substrate.

With this in mind, it is noted that Wang et al. discloses that the material (11) is selectively formed on the substrate (12) and after the formation of the GaN layer (10) thereon, the laser beam is irradiated upon the back surface of the substrate (12). As a result, the GaN layer (10) is formed on the sapphire substrate (12) with the island (13) at which the GaN layer (10) is retained without being decomposed. In addition, Wang et al. discloses the underlying stress relief between the substrate and the GaN layer. However, this reference clearly fails to disclose generating any cracks between the substrate (12) and the GaN layer (10) as is recited by Applicant's claimed invention.

Moreover, it is noted from column 3, lines 5-12 of Wang et al. that a plurality of islands (13) are formed on the GaN layer, and the sapphire substrate (12) and the GaN layer (10) are bonded with each other. Accordingly, the GaN layer (10) and the sapphire substrate (12) of Wang are processed together in accordance with the teachings of Wang.

A structure wherein the sapphire substrate is bonded to the GaN layer with the island (13) is clearly different from the structure obtained in accordance with Applicant's claimed invention as set forth in claim 1 as amended. As set forth in claim 1, as amended, the cracks

are generated between the upper surface of the raised portion of the base substrate and the semiconductor layer, so as to separate the semiconductor layer from the base substrate. Consequently, the structure set forth in accordance with the present invention is clearly different from that disclosed in Wang et al. in that the GaN layer is separated from the substrate by irradiating a laser beam upon the GaN layer.

With respect to each of independent claims 3 and 5-8, these claims likewise recite a third step of irradiating an interface between the semiconductor layer and the base substrate with a laser beam so as to generate cracks at the interface between the top of the raised portion of the base substrate and the semiconductor layer, thereby separating the semiconductor layer from the base substrate to form a semiconductor substrate from the semiconductor layer. Accordingly, it is respectfully submitted that these claims likewise clearly distinguish from the teachings of Wang et al.

Additionally, with respect to the teachings of Asai et al., this reference merely discloses that the GaN layer is formed on the substrate in which ditches or raised and recessed regions are formed. Accordingly, this reference makes no mention of irradiating the interface between the semiconductor layer and the base substrate with a laser beam so as to generate cracks at the interface between the top of the raised portion of the base substrate and the semiconductor layer. Accordingly, even if one were to combine the references in the manner suggested by the Examiner, and the laser beam were to irradiate the back surface of the substrate of Asai et al., it is unclear where the cracks would be generated in the substrate to separate the semiconductor or even if cracks would be generated at all. Accordingly, it is respectfully submitted that the patent to Asai et al., does nothing to overcome the aforementioned short comings associated with the teachings of Wang et al., and the combination clearly fails to disclose or remotely suggest that which is presently set forth by Applicant's claimed invention. Accordingly, it is respectfully submitted that Applicant's claimed invention as set forth in each of independent claims 1, 3 and 5-8, as well as dependent claim 2, clearly distinguishes over the combination proposed by the Examiner and is in proper condition for allowance.

With reference to page 4 of the Office Action, claim 4 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al., in view of Asai et al., as applied to claims 1-3, and 5-8 above, and further in view of U.S. Patent No. 6,348,096 issued to

Sunakawa et al. This rejection is likewise respectfully traversed in that the patent to Sunakawa et al. does nothing to overcome the aforementioned short comings associated with a combination of Wang et al. and Asai et al., set forth by the Examiner.

Initially, it is noted that claim 4 was directly dependent upon independent claim 3 and is likewise believed to be in condition for allowance for the reasons discussed herein above. Furthermore, while Sunakawa et al. may disclose that performing a nitride layer by providing a base substrate comprising sapphire whose main surface is in the {0001} plane orientation, and the direction of the zone axis of a plurality of grooves (13) in the <1-100> direction in the base substrate, this reference continues to fail to disclose or remotely suggest the step of irradiating an interface between the semiconductor layer and the base substrate with a laser beam so as to generate cracks at the interface between the top of the raised portion of the base substrate and semiconductor thereby separating the semiconductor layer from the base substrate to form a semiconductor substrate from the semiconductor layer. Accordingly, it is respectfully submitted that Applicant's claimed invention as set forth in dependent claim 4 which includes all the limitations of independent claim 3 is in proper condition for allowance.

With reference to paragraph 5 of the Office Action, the Examiner appreciates that the combined teachings of Wang et al. and Asai et al. fail to expressly teach the specific region where stress is being generated. The Examiner goes on to state; however, that by performing the method of forming semiconductor layers of Wang et al. and Asai et al., a semiconductor is formed on a base substrate having top and recessed portions. The Examiner goes on to state that since the combined teachings of Wang et al. and Asai et al. are forming a semiconductor layer comprising the same material as that of the claimed invention, on a base substrate comprised of the same material as that of the claimed invention, one of ordinary skill in the art would achieve the same result. Clearly, this is not the case. Neither the patent to Wang et al. nor that of Asai et al. disclose or remotely suggest irradiating an interface between the semiconductor layer and the base substrate with a laser beam so as to generate cracks at the interface between the top of the raised portion of the base substrate and the semiconductor layer thereby separating the semiconductor layer from the base substrate to form a semiconductor substrate from the semiconductor layer, as specifically recited in independent claims 3 and 5-8. Nor does the Wang et al. or Asai et al., or the combination thereof recite a step where the laser beam is irradiated upon the semiconductor layer from the

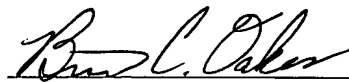
surface opposite to the upper portion of the base substrate so as to generate cracks at the interface between the top of the raised portion of the base substrate and the semiconductor layer, as is specifically recited in independent claim 1. Accordingly, in that neither the patent to Wang et al. or that of Asai et al., or the combination thereof remotely discloses or suggest that which is presently set forth by Applicant's claimed invention, it is respectfully submitted that each of independent claims 1, 3 and 5-8 as well as dependent claims 2 and 4 clearly distinguish over the combination proposed by the Examiner.

With respect to new dependent claims 9-14, each of these claims are directly dependent from one of independent claims 1, 3, 5, 6, 7, and 8, including all the limitations thereof. Accordingly, it is respectfully submitted that these claims are likewise believed to be in proper condition for allowance.

Therefore, in view of the foregoing, it is respectfully requested that the rejections of record be reconsidered and withdrawn by the Examiner, that claims 1-14 be allowed and that the application be passed to issue.

Should the Examiner believe a conference would be benefit in expediting the prosecution in the instant application, he is hereby invited to telephone counsel to arrange such a conference.

Respectfully submitted,



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